A Work Project presented as part of the requirements for the Award of an International Master's degree in Finance from the Nova School of Business and Economics.

MANAGEMENT ACCOUNTING FIELD LAB:

IMPLEMENTATION OF A COSTING SYSTEM FOR THE HYBRID ORGANIZATION

SEMEAR BIPP

Vinicius Giunta Bueno - 40596

Work project carried out under the supervision of

Professor Marta Almeida

04th January 2021

Abstract

A consulting project developed during a four-month period aimed at implementing managerial accounting tools such as a costing system for a Portuguese Hybrid called *Semear BIPP* was used with excel worksheets. The tool is easily updated and can support managers' decision-making processes in a timely and accurate manner. In order to have a better understanding of the costs, a model that was tailored regarding each business unit specificity was provided. A single overhead rate using a Traditional Costing System was implemented for the charity business, and a Time Driven Activity Based Costing System was implemented for the commercial business.

Keywords: Consulting Project, Costing System, Hybrid Organization, Time Driven Activity Based Costing System, Traditional Costing System

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

Table of Contents

II. Individual Part

4. Introduction to Costing Systems

To contextualize the topic of costing systems, it is important to point out that the role of management accounting is to provide information to managers inside the organization to support them to make better decisions and improve operations (Drury, 2014, p. 34). One of the differences between management accounting and financial accounting lies in the users of information provided, the first focusing on internal reporting and the second on external reporting. External reporting follows GAAP - Generally Accepted Accounting Principles. Although the different information users, there is an important piece of information that both fields of accounting have a combined interest: costs.

In order to report profitability, following GAAP rules, it is important to allocate costs between Cost of goods sold (COGS) and inventories, this is related with the financial reporting function (KAPLAN, 1999) and to do so, the calculation of the product's cost is mandatory. From an internal perspective, knowing the cost of each product, for instance, is important to make better decisions as measuring the product cost can be used to define a pricing strategy and calculate profitability (KAPLAN; ANDERSON, 2007). In this thesis, the calculation of product costs will be done through a management accounting system that provides timely cost information (KAPLAN, 1999) for managers within the organization. This system requires the allocation of indirect costs to cost objects, practice for this allocation process has faced many changes after the 1980s with the increase in the usage of information systems. To understand a costing system, some terms used in the literature must be introduced.

4.1. *Cost Object*

The first concept to be introduced is *cost object*, which is basically putting a cost on something (Horngreen; Datar; Rajan, 2015). The *cost object* is what the managers want to know

the cost of. Typically, it can be for a product, a service, clients, or an activity. Assigning costs to *cost objects* can be done through direct and indirect costs.

4.2. Direct and Indirect Costs

Direct costs are directly related to the *cost object* in a sense that it is only possible to have a direct cost if it can be traced to a *cost object* (Drury, 2014); otherwise, it will be an indirect cost, also known as overhead. Direct costs are all costs that do not need an allocation. They will be traced directly to the *cost object*, such as direct materials and direct labor. An example of direct material could be an ingredient used to produce a pie. In this simple example, the pie is the *cost object* and the ingredients used to produce this pie are the direct materials. Following the same example, direct labor would be someone whose only job is to mix all the ingredients so as to have the pie baked.

Indirect cost can provide resources for more than one product (Kaplan; Atkinson, 1998) therefore it cannot be traced directly to a product. The rent of the bakery store cannot be directly traced to the pie that was baked. In order to allocate this cost to the pie, an allocation process will be required, and ideally it should be done through an accurate costing system. The costing system will be able to calculate a *cost driver rate* in order to guarantee a proportion of the cost of the rent in the final cost of the pie.

4.3. *Cost Driver and Cost Driver Rate*

Cost Driver is the allocation base, which is the basis that is used to allocate costs to *costs objects* (Drury, 2014) that has a cause-effect relation between an indirect cost and a *cost object* (Horngren; Datar; Raja, 2015) and it can be, for instance, the level of activity, or volume if any cause-effect exists. The process of cost allocation needs an estimate, a *cost driver rate*, which will reflect the proportion each cost object consumed from the cost driver. Until the Activity Based Costing System introduction in the 1980s, cost allocation was done mainly through traditional costing systems (Drury, 2014) which will be better explained in section 4.8.

4.4. *Period Cost*

The difference between a *period cost* and a *product cost* is that *period costs* cannot be traced to inventory valuation. *Period cost* will always be reported in the profit and loss of the period whereas a *product cost*, if the product is not sold, will be treated as an asset, and will be recorded in the balance sheet in the inventory section. For *Semear BIPP* only managers' wages were assumed to be *period costs* and all other costs were allocated to a *cost object*.

4.5. Budgeted Costs and Actual Costs

A costing system informs managers what the budgeted costs are and when a month passes by it should also show managers what the actual costs are. A budgeted cost is used in planning and decision-making processes. If a company has historical data, it can be easier to budget costs in a more accurate manner. After the budgeting period, managers must compare the budgeted costs with actual costs. If the variance between the actual and the budgeted costs is considerably high, it might lead managers to change pricing strategy, for example, will change to maintain the expected product margin based on actual costs.

4.6. Cost Behaviour

The term *cost behaviour* is related to fixed and variable costs. Fixed costs, as the name suggests, will remain constant for a specific time period regardless of the volume of activity, such as the rent of the bakery store. On the other hand, variable costs will vary in proportion to the level of activity. A good example of a variable cost is direct materials. Returning to the pie example introduced earlier to explain direct materials, the total cost of ingredients to produce a given product will change according to the number of pies produced, which is then multiplied by the unit variable cost of each ingredient, whilst the rent will remain fixed no matter the amount of pies produced.

4.7. Cause-and-effect and Arbitrary allocation

The allocation process can be done using arbitrary or cause-and-effect allocation basis. An arbitrary allocation tries to allocate costs using a cost driver that is as reasonable as possible,

but it is not always a significant determinant of the cost (Drury, 2014) therefore it can cause an inaccurate allocation of indirect costs to the *cost object*. The cause-and-effect allocation uses a cost driver that is determinant of the cost, meaning that it will achieve a more accurate cost compared to an arbitrary allocation. The difficulty is to find a clear cause-and-effect base to allocate some overheads to cost objects.

4.8. Costing System

There are two types of costing systems: Traditional Costing Systems (TCS) and Activity Based Costing Systems (ABC). This section introduces both costing systems along with specificities that can be applied to each one. One of the goals, for both costing systems is to allocate indirect costs to a *cost object*. Managers also want to rely on information provided by the costing system to make strategic decisions related, for instance, to performance and control.

Since the Medieval Era, guild members used detailed cost information to certify product quality (KAPLAN; ATKINSON, 1998). In the early nineteenth century, the textile industry introduced the *cost driver* concept, such as cost per yard and it was further developed with the scientific management movement[1] by introducing the TCS that relies mainly on *cost drivers* that confer an arbitrary cost allocation to a *cost object* (Topic Gateway Series, 2008) and will rarely meet a cause-and-effect cost allocation. TCS allocation process aims to define a *cost driver rate* that can be used to allocate costs to the *cost object*. An example to illustrate this could be the allocation of 5% of an indirect labor of the bakery shop, to the pie, because it corresponds to 5% of the total production. There is no clear cause-and-effect in the *cost driver* to be allocated like that, because in this case, the amount of hours spent in the activity would allocate more consistently indirect labor salary. The cost could be allocated to an activity before allocating it to a *cost object*.

[1] Administration model developed by Frederick Taylor

This can illustrate one of the reasons why a traditional costing system is simpler but not always the most accurate. According to Kaplan and Anderson (2007) TCS requires only three cost categories: labor, material and overhead. Eaton (2005) said that to perform a TCS three steps are needed: calculate the total cost of a specific department, allocate overheads to production departments then allocate the costs of the production departments to cost object. The most simplistic TCS will do the allocation process with a single *cost driver* when the overhead consumption in a *cost object* is likely to be in the same proportion therefore it will use a single overhead rate to allocate overhead costs. More complex TCS use multiple overhead rates established for a department before allocating the overhead cost to a *cost object*.

Activity-Based Costing Systems were introduced in 1980s to correct deficiencies of the TCS, such as the arbitrary allocation. This new costing system arises from the fact that technologies are already well introduced in the production. Kaplan and Anderson (2007) also mentioned that many companies shifted from a massive production strategy to a more client focus oriented one. The result is mainly related to a decrease in direct costs, and an increase in indirect costs with more engineers, marketing, machine setups, etc.

The arbitrary allocation used in the TCS was no longer able to calculate the correct profitability of its cost objects with today's globalization where competition within multinational corporations is intensive and managers should use correct insights in order to survive. *Cost drivers* used in traditional costing systems were simple and usually did not reflect the correct relation between product cost and the consumption of work activities it consumes (Cokins; Paul, 2016). Calculating costs inaccurately can lead managers to choose a losing strategy (Kaplan, 1988) and can put a company out of business (Robin Cooper, 1989).

The ABC model arises from a need, and the allocation process involves tracing resource consumption assigned to activities and allocating it to a *cost object* based on consumption estimates (Topic Gateway Series, 2008). ABC tends to have a more accurate costing by adding

to the cost object costs from activities such as packing orders. The main change from the TCS relies on the perception that activities, not departments, cause additional costs.

The process of ABC to understand the consumption of resources by each activity was done mainly through interviews, surveys, and observation to understand the amount of time employees spend on each activity (Kaplan; Anderson, 2003). After calculating this time, it was possible to compute an activity *cost driver rate* – the total cost to perform the activity divided by the total amount of time available. This rate will be used to allocate the activity cost to a *cost object*. By inserting this activity cost to a *cost driver*, accuracy was achieved, although also adding more complexity when there will probably be at least more activities to achieve the objective of calculating the real consumption by using a cause-and-effect allocation instead of the arbitrary allocation used in TCS.

To maintain its accuracy ABC system needs to be updated to reflect the reality after any change in a company's operation. In practical terms ABC often fails to be maintained and therefore, costs estimates are no longer reliable. In addition, overall, "ABC Systems are expensive to build, complex to sustain and difficult to modify" (Kaplan; Anderson, 2003, p. 16). While companies could understand the value proposition ABC system brought to the process of cost allocation, they noted that it was not totally accurate in a sense that each activity could have a specificity, and the model was built to allocate cost for activities in a standardized way. ABC always assumes a practical capacity of a hundred per cent, which means that every employee is productive during the entire day, which, in turn, for example, inflates product costs.

The complexity process of interviews and the inaccurate activity allocation had "prevented activity-based cost systems due to being an effective, timely, and up-to-date management tool" (Kaplan; Anderson, 2003 p. 15). An adaptation of this model called Time-Driven ABC (TDABC) was created and it is easy and fast to implement and provides

meaningful and actionable information, to managers which is both quicker, and inexpensive (Kaplan; Anderson, 2003 p. 15).

TDABC costing system avoids the costly and time-consuming process of conventional ABC (Kaplan; Anderson, 2007) by creating a time equation that assigns resources' costs to a cost center and *cost objects*. Only three parameters are needed to allocate consumed resources costs. Firstly, two parameters used to calculate the capacity cost rate, have as the numerator, the total cost of the resources used to perform an activity such as personnel, and the numerator is this total cost using the practical capacity – practical time available from all resources performing this activity, generally employees. The output is often the cost per hour/minute of the capacity supplied.

The last parameter is capacity usage that estimates a unit time to perform each activity that no longer needs precision, "rough accuracy is sufficient" (Kaplan; Anderson, 2003). It is now possible to calculate the unit cost for each activity by multiplying the capacity cost rate, calculated previously, by the total time to perform a specific activity. This approach replaces the process of interview and all information required to achieve a powerful costing system can be easily accessed in any ERP system.

For the current global competition scenario, TDABC tends to appear the most effective and efficient system to be used to extract relevant and accurate information without wasting time due to the easy adaptability of the model, should any change be needed in the time equation. To guarantee that the system output corresponds to the managers' expectations, some investing in technology could be needed to guarantee better results. To confirm that this investment must be implemented the trade-off between having inaccurate information and the investment should rely on minimizing total costs (Cooper, 1998). Therefore, it is not always the case that this trade-off will show that changing the costing system will pay off.

5. Implementing Costing System in a Hybrid Organization

5.1. Consulting Project Introduction

A consulting project carried out within a Portuguese social hybrid organization called Semear started in September 2020. A deep process to extract information through interviews/ meetings and from data bases was started (Appendix 2). After analyzing all collected data, the model for *Mercearia* started to be created. The first presentation of the early-stage model was important to grab attention from some of the *Semear's* managers, who started to rely on us. This was a huge leap towards the goal of the project, because the company's management was mainly focused on daily problems and could not invest time building tools to plan for the future.

Focusing on the costing systems built for *Semear* and the reasons behind the decisions to solve each specificity, the next sub-sections present the different approaches used to allocate the indirect costs to a *cost object* for each of Semear business units. Each business unit will have a tailored costing system according to the specific needs of each business, meaning that different costing systems were used according to their businesses.

5.2. Semear Academia costing system

Semear Academia is the charity business inside Semear BIPP and is the reason why all other commercial businesses exist. Providing a service for the community allows *Semear Academia* to be part of a government program called *IEFP*. This program is responsible for reimbursing on a bi-monthly basis, almost all costs related to *Academia 3*. To guarantee this reimbursement there is a driver for the *IEFP* related to the total volume of classes given, which means that *IEFP* can only reimburse *Semear* costs, if students have attended classes.

This piece of information was an important step to define the best costing system to be implemented. Even though *Academia* had other degrees, the main issue to resolve according to *Semear BIPP* CFO, was the process to guarantee the *IEFP* reimbursement by the end of each month in a clear and simple way in addition to maximizing the reimbursement as much as

possible. This process was completely manual and inaccurate, where each month, *Academia's* administrative staff, had to collect information of the amount of time spent in *Academia 3* to allocate part of the salary of each fixed labor to guarantee IEFP reimbursement. For other overheads, a random ratio was inserted in order to allocate costs to *Academia 3*.

The allocation process was extremely hard to understand and to prove, and the way *Semear* was doing it, they would never be able to maximize the grant received by IEFP, if they were not tracing the most important driver to allocate all costs: the total volume of formation per month. To solve *Academia's* problem, it was decided that we would allocate all costs using only the *cost driver* that was important to receive IEFP reimbursement, which is also the driver of the core activity performed by the business unit. Therefore, a single overhead rate of the core activity became the most important piece of information of *Academia's* costing system since the consumption of the resources is likely to be in the same proportion as the *cost object,* and it is the driver that guides the government's reimbursement process. As shown in Graph 1 (Appendix 8) costs will have a high correlation with the total volume of attendees.

To extract the best information for management decision regarding actual and budgeted costs, two main pieces of information should be inserted in the model. The first one is the plan for the upcoming year, for each degree. In this plan, the amount of time expected to be spent on each degree during each month should be specified. This will be useful to calculate the total possible volume of attendees if all students attend all classes. This piece of information will be crucial to understand how much money *Academia* can receive as a reimbursement from the government. The second and most crucial piece of information for the model and for the reimbursement process is the invoice for the actual result which will be inserted during each activity/class; how many students attended the classes as well as other relevant qualitative information from the classes.

This invoice process will guarantee that administrative staff will not need to receive a monthly excel file from anyone and it will calculate how much *Academia 3* will be reimbursed by the end of each month, since the information can be collected on a daily basis within seconds and the actual *cost driver* will be the proportion Academia staff will allocate for other costs such as, for example, security, water, electricity, among others.

Another goal that *Academia* had was to prove to IEFP that the *Academia 2* degree, besides having more students throughout the year; was able to insert more individuals with disabilities into the job market. In addition, BIPP CFO wanted to prove that this degree had a lower student cost than the unit cost for *Academia 3* so that they could prove to IEFP that it was also financially better. It was only possible to make a comparison if there was a standard model that could receive the planned activities for both degrees for 2021 to compare them.

The tool built for *Academia* achieved all the goals *Semear's* top management were expecting from the project. The median hourly cost per student for *Academia 3* for 2021 is 8.88 euros while for *Academia 2* it is 5.24 euros, and this piece of information could be found in less than a minute. The other important piece of information was the monthly allocation process to receive the reimbursement from the IEFP. For 2021, *Academia 3* is expected to have an average monthly cost around nineteen thousand euros, which represents around 45% of the total *Semear Academia's* budgeted costs. Variances in the actual dashboards were also included to identify how much of the total costs will be *Academia's* responsibilities, which had not been planned. The *Academia* model is already in use and it was the main source of information for the CFO to come up with the budgeting for 2021.

5.3. Semear Mercearia costing system

Mercearia is a manufacturing and merchandizing business whose objective is to support BIPP's financial sustainability. To provide financial sustainability, *Mercearia* has as its main source of revenue the sale of a product called "cabaz" – a basket of food related products –

during Christmas time. These products, as mentioned earlier, were divided into three categories – P1, P2 and P3. In 2020, these revenues accounted for more than one million euros and represented more than 90% of the total annual sales.

The project started in September and *Mercearia* was starting a massive sales period when they realized they did not have a working system, from which they could check inventory information. Hence, the first focus of the entire project was to guarantee Mercearia' s annual sales. As inventory is an important part of a costing system, it was possible to realize how important a more accurate costing system could be for *Mercearia* Managers.

After coming up with this transactions model, where it was possible to register all the movements of the ingredients and the products from the order from a supplier until the sale to a client, *Mercearia' s Operations Manager*, could start the Christmas sales process with all the information needed in one excel file. The remaining problem was to guarantee that *Mercearia* was not selling products at a loss; therefore, a more powerful tool started to be built to allocate indirect costs to cost objects.

To trace *direct costs* – ingredients and materials - it is important to mention that when producing food related products, a normal loss may occur, and it should be considered in the production process. By knowing the cost of each ingredient and material, and how much was used in the production, a BOM - Bill of Materials - was built to facilitate and guarantee a more accurate cooking, assembling, and packaging process for each product and a Standard Cost Card was also included in all the costs of all the materials. In order to have an accurate unit cost for each product, the company decided to allocate indirect costs by using the principles of a TDABC costing system. It should be simple, accurate and inexpensive.

Fixed labor that cannot be directly traced to product and manufacturing overheads costs, such as water, for example was divided into *Mercearia's* three main activities: Cooking, Packing and Assembling. The time equation built considers a specific time for each product

and can be accessed in the appendix (Appendix 5, 6 and 7). It is important to highlight that the model was adapted to better fit the way *Mercearia' s Operations Manager* did the observation when allocating the time for each activity and for each product. If, in the future this time changes, as it should happen with continuous improvement, it will be easy to change this piece of information, and it will directly reflect in the Standard Cost Card. Now it is important to know the cost per minute of capacity supplied. *Mercearia* only has six employees working full time. An arbitrary practical capacity rate of 90% was used - it can be easily changed to reflect reality - and the numerator of the capacity cost rate was about to 850 hours available per month to perform activities, out of a total of 950 hours. The total cost of the resources used to perform an activity was about eleven thousand euros per month. Therefore, we were able to calculate the cost rate of around thirteen euros per hour.

The combination of the cost rate and the amount of time expected to perform each activity enables the model to calculate manufacturing overhead unit costs, which were missing in the product profitability dashboard, in a timely manner, and can be easily changed if necessary.

5.4. Semear Terra costing system

A costing system for was not a priority for *Semear Terra.* It has a new manager, and many process and strategic decisions are being revised for the upcoming years, such as a decrease in the number of products produced. Besides talking to the consulting team, *Terra's* Managers could not invest the same amount of time to the project compared to *Semear Academia* and *Mercearia*. Therefore, it was not easy to develop a powerful and tailored tool due to time and interest issues.

To prepare a model for *Terra,* managers decided to replicate Mercearia's model, since the main product of both business units, "*cabaz*", is somehow similar, but in this case, they are biological products. Not many changes were made, basically the changes were the "ingredients" used to produce the final product are now seeds. The activities were adapted to

reflect Terra's business of planting. It was possible to calculate costs using harvest activity, since we only had the time from planting to harvest. Therefore, it was not possible to have a more consistent allocation for overheads that has no relation with production process, but it is performing other activities such as assembling bio cabaz and delivering it to each client.

Semear Terra is going through a dramatic change with the new manager, and it seems that not enough time is available, and there is not much interest in having a tailored costing system that takes the business specificity to have the most accurate costing; because in this business, price is often set by the market, and adding complexity to *Terra's* model will not guarantee many benefits compared to *Academia* and *Mercearia*. Due to the project's time frame, it was decided to focus on the business units that were willing to implement an accurate costing system.

6. Conclusions and Future Recommendations

BIPP top managers can now, in a timely manner, provide information to guarantee *Academia 3's* reimbursement and hopefully will convince IEFP to accept *Academia 2* in IEFP program. *Mercearia's Operations Manager* now has access to information related to inventory and product in a more reliable and timely way. This combination can give *Mercearia* managers a better position to make more accurate decisions more efficiently, which will lead the business unit into continuing its growth process without selling any product at a loss or losing a client because it was not possible to answer the client's request in a timely manner due to inventory issues.

Defining the best costing system is not an easy task and deciding which of the options available are the best ones to be implemented is crucial. Also, the reality and the moment of the organization should be considered. The literature focuses on large companies that have thousands of employees and activities to induce a better cost system, but that is not always the case. Cases of small business or even a hybrid organization with fewer than 50 employees were

not found in the literature. There is no case study that show trade-off from one costing system to another for smaller businesses. Hence, there was not a clear step by step to follow to introduce or improve a costing system for a hybrid organization.

This demonstrate a limitation in the literature related to costing systems for businesses that have a source of revenue from the government that can be directly attached to attached to a cost driver, which is one more reason to implement a reliable costing system in this type of organization in order to provide information to the government and to guarantee a financial stability of the business. Therefore, future studies could explore the implementation of costing systems in hybrid organizations as one of the examples that would represent a highly interesting and important step towards those organizations' independence.

III. References

Cokins, Gary; Paul, Douglas D. Time-Driven or Driver Rate-Bases ABC?. (2016) Strategic Finance Magazine. February 1, 2016. Accessed December 01, 2020 <https://sfmagazine.com/post-entry/february-2016-time-driven-or-driver-rate-based-abc/>

Cooper, Robin. 1998. You Need a New Cost System When. Harvard Business Review February 1989. Accessed December 12, 2020 < https://hbr.org/1989/01/you-need-a-new-cost-system-when>

Cooper, Robin. Kaplan, Robert S. 1989. The Design of Cost Management Systems, 2nd edition. Prentice-Hall, Inc. 1991.

Drury, Colin. 2008. Management and Cost Accounting, 7th Edition. Cengage Learning. 2008

Horngreen, Charles T.; Datar, Srikant M.; Rajan, Madhav V. 2015. Cost Accounting – Amanagerial Emphasis. Pearson Education Limited.

Kaplan, Robert S. One Cost System Isn't Enough. Harvard Business Review Magazine, January 1988. Accessed December 18, 2020 <https://hbr.org/1988/01/one-cost-system-isnt-enough>

Kaplan, Robert S., and Atkinson, Anthony A. 1998. Advanced Management Accounting, Third Edition. New Jersey: Prentice Hall.

Kaplan, Robert S.; Anderson, Steven R. 2007. Time-Driven Activity-Based Costing - A simpler and more powerful path to higher profits. Harvard Business School Publishing Corporation.

Smith, Wendy K.; Besharov, Marya L. (2019). Bowing before Dual Gods: How Structured Flexibility Sustains Organizational Hybridity. Administrative Science Quarterly, Vol. 64(1)1-44. Accessed December 12, 2020 <https://journals.sagepub.com/doi/10.1177/0001839217750826>.

IV. Appendixes

Appendix 5. Table 3 – Assembling Time for all Semear Products

ASSEMBLING							
Product	Start Date	End Date	Employees	Hours	Units per Hour	Time Spent	Cost
All Products	01/01/2021	-	10	3,5 h	760	0,046 h	0,65 €

Appendix 6. Table 4 – Packing time for Semear Products

PACKING							
Product	Start Date	End Date	Employees	Hours	Units per Hour	Time Spent	Cost
Amendoim Caramelizado	01/01/2021	-	1	1,0 h	100	0,010 h	**0,14 €**
Areias	01/01/2021	-	3	6,0 h	500	0,036 h	**0,51 €**
Azeite Aromático Para Carne	01/01/2019	-	2	4,0 h	300	0,027 h	**0,38 €**
Azeite Aromático Para Salada	01/01/2021	-	2	4,0 h	300	0,027 h	**0,38 €**
Azeite Virgem Extra	01/01/2021	-	2	4,0 h	300	0,027 h	**0,38 €**
Broas De Noz E Mel	01/01/2021	-	3	6,0 h	500	0,036 h	**0,51 €**
Castanhas Em Calda	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Cebolinhas Caramelizadas	01/01/2021	31/10/2021	7	3,0 h	1150	0,018 h	**0,26 €**
Chutney De Ameixa	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Chutney De Manga	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Confit De Pimentos	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Doce De Abóbora	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Doce De Frutos Silvestres	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Doce De Morango Com Espumante	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Doce De Physalis	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Doce De Tomate	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Figos Em Vinho Do Porto	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Flor De Sal	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Geleia De Alecrim	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Geleia De Malagueta	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Grão De Bico	01/01/2021	-	2	1,0 h	100	0,020 h	**0,28 €**
Infusão Canela E Gengibre	01/01/2021	-	1	1,0 h	100	0,010 h	**0,14 €**
Infusão Chá Verde E Menta	01/01/2021	-	1	1,0 h	100	0,010 h	**0,14 €**
Mostarda	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Pasta De Azeitona	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Pate De Cogumelos	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Piripiri	01/01/2021	-	2	4,0 h	300	0,027 h	**0,38 €**
Sal Da Horta	01/01/2021	-	7	3,0 h	1150	0,018 h	**0,26 €**
Vinagre Aromático	01/01/2021	-	2	4,0 h	300	0,027 h	**0,38 €**
Cebolinhas Caramelizadas	01/11/2021	-	6	4,0 h	1000	0,024 h	**0,34 €**

Appendix 7. Table 5 – Cooking time for Semear Products

COOKING							
Product	**Start Date**	**End Date**	**Employees**	**Hours**	**Units per Hour**	**Time Spent**	**Cost**
Azeite Aromático Para Carne	01/01/2021	-	2	1,0 h	50	0,040 h	**0,57 €**
Azeite Aromático Para Salada	01/01/2021	-	2	1,0 h	50	0,040 h	**0,57 €**
Azeite Virgem Extra	01/01/2021	-	2	1,0 h	100	0,020 h	**0,28 €**
Castanhas Em Calda	01/01/2021	-	2	5,0 h	170	0,059 h	**0,83 €**
Cebolinhas Caramelizadas	01/01/2021	30/09/2021	2	5,0 h	120	0,083 h	**1,18 €**
Chutney De Ameixa	01/01/2021	-	2	6,0 h	200	0,060 h	**0,85 €**
Chutney De Manga	01/01/2021	-	2	6,0 h	220	0,055 h	**0,77 €**
Confit De Pimentos	01/01/2021	-	2	6,0 h	200	0,060 h	**0,85 €**
Doce De Frutos Silvestres	01/01/2021	-	2	7,0 h	220	0,064 h	**0,90 €**
Doce De Morango Com Espumante	01/01/2021	-	2	7,0 h	150	0,093 h	**1,32 €**
Doce De Physalis	01/01/2021	-	2	7,0 h	130	0,108 h	**1,53 €**
Figos Em Vinho Do Porto	01/01/2021	-	2	5,0 h	150	0,067 h	**0,95 €**
Flor De Sal	01/01/2021	-	2	2,0 h	200	0,020 h	**0,28 €**
Geleia De Alecrim	01/01/2021	-	2	2,0 h	200	0,020 h	**0,28 €**
Geleia De Malagueta	01/01/2021	-	2	20,0 h	400	0,100 h	**1,42 €**
Grão De Bico	01/01/2021	-	2	4,0 h	200	0,040 h	**0,57 €**
Infusão Canela E Gengibre	01/01/2021	-	2	6,0 h	200	0,060 h	**0,85 €**
Infusão Chá Verde E Menta	01/01/2021	-	2	6,0 h	200	0,060 h	**0,85 €**
Mostarda	01/01/2021	-	2	6,0 h	220	0,055 h	**0,77 €**
Pasta De Azeitona	01/01/2021	-	2	6,0 h	400	0,030 h	**0,43 €**
Pate De Cogumelos	01/01/2021	-	2	4,0 h	130	0,062 h	**0,87 €**
Piripiri	01/01/2021	-	1	1,0 h	100	0,010 h	**0,14 €**
Sal Da Horta	01/01/2021	-	2	4,0 h	300	0,027 h	**0,38 €**
Vinagre Aromático	01/01/2021	-	2	4,0 h	200	0,040 h	**0,57 €**
Cebolinhas Caramelizadas	01/10/2021	-	1	7,0 h	100	0,070 h	**0,99 €**

Appendix 8. Graph 1 – Budgeted Costs and Teaching Volume for Academia 3 during 2021